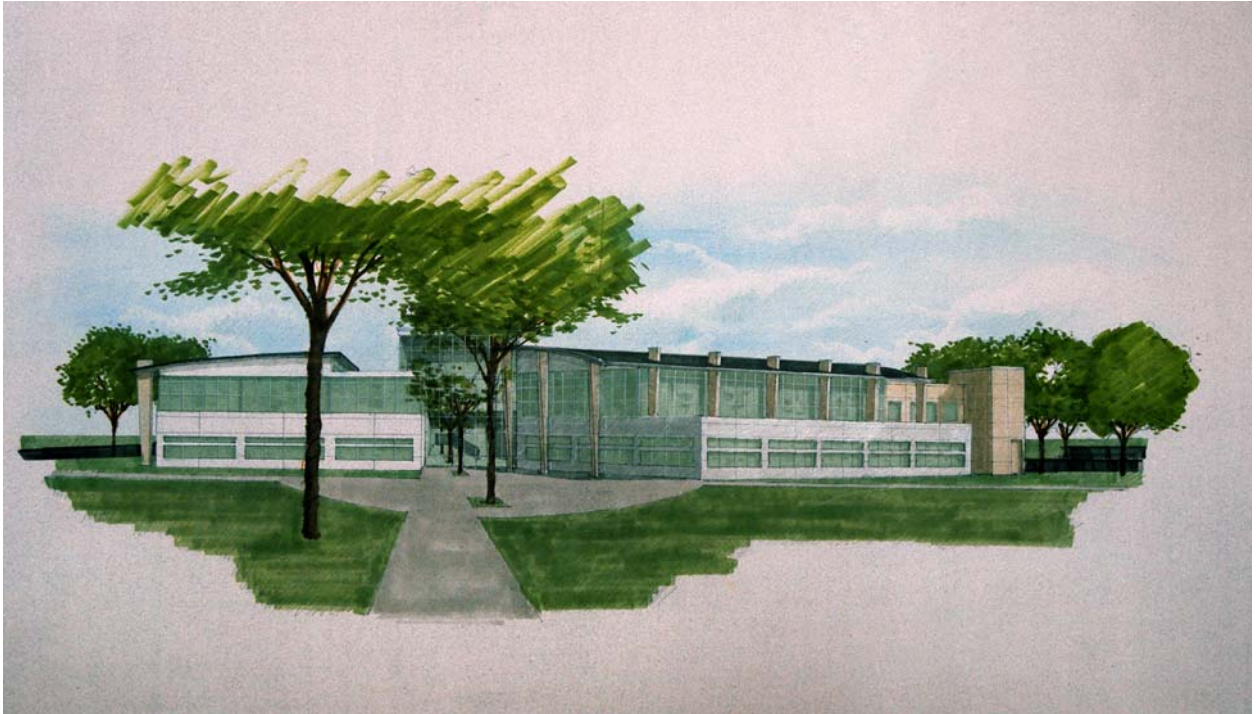


Project Functions and Requirements Document



Project No. MEL-001-027
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Research Support Building – Ph. I



PLANT ENGINEERING DIVISION
ENGINEERING & CONSTRUCTION SERVICES

BROOKHAVEN NATIONAL LABORATORY

BROOKHAVEN SCIENCE ASSOCIATES

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APPENDIX A – PROGRAM REQUIREMENT FORMS

Human Resources
Staff Services
Diversity Office
RHIC & AGS User Reception
Security Badging
Community Involvement
Media & Communications
CEGPA Administration
Science Museum Group
Photography & Graphic Arts
Business Systems
Credit Union

APPENDIX B – BNL DESIGN CRITERIA

APPENDIX C – LEED CREDIT REQUIREMENTS

Project Functions and Requirements Document for Research Support Building – Phase I

1.0 PROJECT MISSION

The project mission is to comply with the BNL strategic infrastructure plan to improve operational efficiency by consolidating support activities and eliminating substandard World War II era wood frame buildings. This project will consolidate functions supporting research, reduce the cost of providing these services and improve access to support services for the research community. This will alleviate the current configuration where support services are widely dispersed in inefficient World War II era wood frame buildings, and provide centralized support services to accommodate the “one-stop service” concept for the visiting scientific community.

2.0 UPPER LEVEL FUNCTIONS AND REQUIREMENTS

2.1 Upper Level Functions

- Construct a Research Support Building (RSB).
- Demolish World War II era buildings.

2.2 Upper Level Performance Requirements

- RSB shall have an abovegrade, gross area of 58,000 SF.
- RSB shall be located on Brookhaven Avenue between B-438 and B-459.
- RSB shall incorporate sustainable design principles.
- Demolish 21,000 SF of vacated space.

3.0 LOWER LEVEL FUNCTIONS AND REQUIREMENTS

3.1 Lower Level Functions

- Prepare RSB design drawings and specifications.
- Perform RSB construction activities.
- Relocate support personnel to RSB.
- Demolish B-179 and West Wing of B-459.

3.2 Lower Level Performance Requirements

- The 58,000 SF shall be configured to meet the space needs on the Program Requirement Forms in Appendix A.
- The RSB appearance shall be approved by the BNL Architectural Review Committee.
- The RSB design drawings and specifications shall meet the requirements of BNL Procedure E&CS-100, “Design Criteria” in Appendix B.
- The RSB design drawings and specifications shall comply with the requirements of the following Codes, Rules and Regulations of the State of New York:
 - Building Code of New York State
 - Energy Conservation Construction Code of New York State
 - Fire Code of New York State
 - Mechanical Code of New York State
 - Plumbing Code of New York State
- The RSB design drawings and specifications shall meet the LEED Credit Requirements in Appendix C.
- The RSB heating system shall be designed based on connection to the BNL site 125 psi steam system at Steam Manhole 69.
- The RSB cooling system shall be designed based on connection to the BNL site 44°F, 100 psi, chilled water system at the corner of Bell Avenue and Avery Street.
- The RSB electric power system shall be designed based on connection to the BNL site 13.8 kV distribution system at the existing SF6 switch on Bell Avenue.
- The RSB fire protection system shall be designed based on connection to the BNL site 60 psi potable water distribution system on Bell Avenue. (Flow conditions at Hydrant M-51 are: Static – 51 psi; Residual – 50 psi @ 871 gpm.)
- The RSB telephone system shall be designed based on connecting a 400 pair cable to the BNL central communications center in B-449.
- The RSB computer network system shall be designed based on connecting a 12/24 fiber-optic cable to the BNL central communications center in B-449.
- The RSB HVAC valve and damper actuators shall be pneumatically operated by connecting to the BNL site 100 psi compressed air system at the corner of Bell Avenue and Avery Street.
- The RSB storm water system shall be designed based on discharge to the 24” diameter connection to the BNL site storm sewer system on Bell Avenue.
- The RSB sanitary sewer system shall be designed based on connection to the BNL site sanitary sewer system at Sanitary Manhole 120 on Brookhaven Avenue.

4.0 DESIGN NARRATIVE

The RSB shall be designed to give visiting scientists and new employees the appropriate first impression of BNL as a world class research laboratory. The building design shall incorporate an entrance lobby, first- and second-floor offices, and a partial basement for connection to site utilities. The design shall include all site improvements including landscaping, sidewalks, employee parking, and short-term parking.

4.1 Architectural/Structural

4.1.1 Design Narrative

The RSB exterior shall be a combination of metal panel and glass. The building shall be a two-story structural steel frame with a partial basement. All supported floors shall be 3¼" lightweight concrete fill on 2" deep composite type steel deck, for a total slab thickness of 5¼".

Provide reinforced concrete walls around the basement, supported top and bottom. Footings shall be designed for an estimated allowable soil bearing pressure of 4,000 psf. Both continuous strip footings and individual square footings shall be used.

Provide grade beams at the perimeter of the building.

Stairs at each end of the building shall serve as the main means of egress. Provide an interior monumental stair connecting the main floor with the second floor.

4.2 HVAC

4.2.1 Design Narrative

The design shall consist of air handling units with return fans located in mechanical equipment rooms. Air handling units and their associated return fans shall be equipped with variable frequency drives (VFDs) and operate as variable-air-volume systems. Code required outside air from the outside air louvers shall be mixed with return air, conditioned, and supplied to the building. VAV boxes with hot water reheat coils shall supply diffusers mounted at the perimeter office ceilings above the windows. VAV boxes with reheat coils shall supply ceiling diffusers in the interior offices. Approximately three to six offices shall be supplied by one VAV box. A toilet exhaust fan shall exhaust toilets and janitor closets.

The building shall be supplied with chilled water by connecting to the site chilled water system. A pressure-reducing flow-metering station in the cellar shall reduce the pressure and supply chilled water to the air handling units.

Steam at 125 psig shall be supplied to the building by connecting to the site steam system. Steam condensate shall be pumped back to the site system. An insulated 3-inch steam line and an insulated 1½" condensate line shall be run in separate underground conduits from steam Manhole 69 to the basement mechanical room. A two-stage pressure-reducing station shall reduce steam pressure from 125 psig to 15 psig. The low pressure steam shall be

supplied to the domestic hot water heater and two steam converters that will produce heating hot water for the building. Condensate shall be metered and returned to the system by a condensate pump. Heating hot water from the converters shall be pumped to the air handling units and to the VAV reheat coils.

The design shall utilize direct digital controls, compatible with the existing sitewide Building Automation System. In order to assure full compatibility, the RSB Building Automation System shall be provided by Automated Logic Corporation. Control valves and dampers shall have pneumatic actuators. A compressed air moisture separator and filter shall be installed at the service entrance to the building.

4.3 Plumbing

4.3.1 Design Narrative

Sanitary Drainage and Vent System

The system shall consist of a basic gravity flow sanitary drainage and vent system. Design a complete piping system including floor drains, sanitary drains, soil, waste, and vent piping from all fixtures and equipment. The sanitary house sewer shall discharge to the site sanitary system.

Provide a three (3") inch floor drain and a mop receptor at each janitor's closet.

Storm Water Drainage System

Design a complete piping system including submersible sump pumps in the Basement and elevator shaft, area drains, roof drains and connection to the site storm system.

Domestic Water System

Domestic water distribution shall consist of cold water, hot and hot water return distribution feeding all plumbing fixtures, sinks and HVAC make-up water. At the domestic service connection, an approved water meter and backflow preventer (DCCV) shall be provided and submitted to Suffolk County Department of Health (SCDH) for approval.

Hot water heater shall be Patterson–Kelly Model PK065 steam to water.

Plumbing fixtures shall be low flow type for water closets and urinal in accordance with New York State Building Code and LEED requirements.

4.4 Fire Protection

4.4.1 Design Narrative

Design a combination fire standpipe/sprinkler fire protection system complete with piping, alarm check valve, controls and signs. Connect to the site domestic water system.

The sprinkler system shall consist of a wet pipe sprinkler installation throughout the building. The system shall be hydraulically calculated. Sprinkler heads shall be provided in Elevator Machine Room and elevator hoistways. Sprinkler system shall be provided with floor control assembly consisting of OS&Y valve, water flow switch and 2" drain for each floor. Tamper switches shall be provided on all OS&Y or butterfly valves and connected to the Fire Alarm system.

The entire sprinkler system shall be designed based on Ordinary Group 1 Hazard occupancy with 0.15 GPM/SF density. The remote hydraulic area will be calculated at 2,500 square feet.

The sprinkler system alarm shall connect to the Fire Alarm system.

Fire extinguishers shall be provided and spaced in accordance with NFPA 10 requirements.

4.5 Electrical

4.5.1 Design Narrative

Electric Service

Electric power to the building shall be provided by the site 13.8 kV power distribution system via a step-down transformer. The transformer shall be a pad-mounted, oil-filled, 13.8 kV primary, Delta to 480-Volt, 3 phase, 3-wire Delta secondary. The transformer shall be dedicated to the Research Support Building and rated at 1,000 KVA. The primary side of the transformer shall connect to an existing SF6 switch located behind B-462 on Bell Avenue via an underground ductbank.

The service, metering and main distribution equipment (service disconnect) shall be installed in the Main Switchboard Room located in the basement.

A manual transfer switch at the Main Switchboard shall allow the connection of a portable generator to the building service switchboard in an event of a power outage.

Power Distribution System

Design a building power distribution system to provide supply power to all lighting and power receptacles, mechanical equipment, communication equipment and other loads.

Lighting and power receptacles shall be supplied from 120/208-Volt surge suppression panels served by 480-120/208-Volt K-rated step-down transformers. The switchboard shall also be provided with surge suppression.

The step-down transformers and the 120/208-Volt panels shall be installed in the switchboard room and in electrical closets located on each floor. Power distribution for lighting and receptacles throughout the building shall be provided on a floor-by-floor basis.

Power distribution equipment serving mechanical loads shall be installed in the mechanical room within the basement, utilizing a 480V motor control center.

Lighting

Lighting fixtures shall be installed to provide illumination levels in accordance with the New York State Energy Conservation Code and LEED requirements.

The lighting fixtures shall generally be fluorescent type with energy-saving T8 or compact fluorescent lamps and electronic ballasts, by approved manufacturers at 120 Volts.

Emergency lighting consisting of selected lighting with battery pack shall be provided in corridors, stairs and other areas.

Illuminated exit signs with battery pack shall be provided at every exit door; from each floor; at corridor intersections and changes in direction; and elsewhere as required.

Receptacles

Receptacles (120 VAC) shall be provided in offices and in other areas. Convenience receptacles shall be provided for cleaning and other functions. Specific-purpose receptacles shall be provided to suit the application for particular items of equipment.

GFI receptacles shall be provided as required by the Code.

Grounding

Building grounding system shall consist of a 250 kcmil bare copper conductor loop suspended in building footings. Steel building columns shall be directly connected to the building grounding system via a 4/0 AWG bare copper conductor.

Equipment Power Supply

Branch circuit wiring shall be provided as required to all HVAC equipment (480 Volts for 3 phase motors), plumbing equipment, elevators, control panels for low-voltage systems, etc.

Motor starters shall be provided for all mechanical equipment that is not supplied with factory-installed controllers.

Low Voltage and Communication Systems

Main service cables, both fiber-optic and multi-pair copper, shall be connected to B-449 and BNL will make the final connections to the head-end equipment. The Main Distribution Telecommunication/Data Rack in the basement shall feed patch panels installed in the

Telecommunication Closet on each floor to meet the communication/data requirements for that floor.

Install raceways and outlet boxes, patch panels for communications and data systems in the communication closets on each floor. Equipment such as PBX, servers and telephones shall be provided and installed by BNL.

Fire Alarm System

Fire Alarm System shall be installed in accordance with the BNL "Design Criteria" and the National Fire Protection Association and NEC, latest editions. All equipment/devices shall be UL (Underwriters Laboratory) and/or FM (Factory Mutual) approved. Fire alarm system shall include manual pull-stations, smoke detectors, PIV monitor switch, fire alarm control panel and connection to the sitewide fire alarm system.

The fire alarm panel shall be a Simplex 4100U (addressable) panel. Contractor shall mount the backbox and run conduits to the backbox. BNL or Simplex shall install all electronics and make final tie ins to the panel.

All fire alarm devices must be "compatible" with the Simplex 4100U fire alarm panel.

All fire alarm wiring shall be solid copper; stranded wire will not be accepted.

The system shall tie in to site fire alarm system via a dedicated telephone line.

Seismic Design Requirements

Seismic supports and restraints shall be provided for electrical equipment in accordance with the requirements of the applicable Seismic Code as follows:

- All equipment, motors, conduit and switchgear, and other life safety systems shall be seismically supported and restrained.
- All conduit 2½" and larger diameter, suspended by individual hangers longer than 18 inches from the structure, shall be seismically supported and restrained.

APPENDIX A
Program Requirement Forms

APPENDIX B
BNL Design Criteria

APPENDIX C
Leadership in Energy and Environmental Design
Green Building Rating System
Version 2.1

LEED Credit Requirements for the Research Support Building – Phase I

Sustainable Sites

Prereq 1	Erosion & Sedimentation Control
Credit 1	Site Selection
Credit 4.2	Alternative Transportation , Bicycle Storage & Changing Rooms
Credit 4.3	Alternative Transportation , Alternative Fuel Vehicles
Credit 4.4	Alternative Transportation , Parking Capacity
Credit 6.1	Stormwater Management , Rate and Quantity

Water Efficiency

Credit 1.2	Water Efficient Landscaping , No Potable Use or No Irrigation
Credit 2	Innovative Wastewater Technologies

Energy & Atmosphere

Prereq 1	Fundamental Building Systems Commissioning
Prereq 2	Minimum Energy Performance
Prereq 3	CFC Reduction in HVAC&R Equipment
Credit 1	Optimize Energy Performance
Credit 4	Ozone Depletion

Materials & Resources

Prereq 1	Storage & Collection of Recyclables
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Indoor Environmental Quality

Prereq 1	Minimum IAQ Performance
Prereq 2	Environmental Tobacco Smoke (ETS) Control
Credit 1	Carbon Dioxide (CO₂) Monitoring
Credit 2	Ventilation Effectiveness
Credit 3.1	Construction IAQ Management Plan , During Construction
Credit 3.2	Construction IAQ Management Plan , Before Occupancy
Credit 4.1	Low-Emitting Materials , Adhesives & Sealants
Credit 4.2	Low-Emitting Materials , Paints
Credit 4.3	Low-Emitting Materials , Carpet
Credit 6.1	Controllability of Systems , Perimeter
Credit 7.1	Thermal Comfort , Comply with ASHRAE 55-1992
Credit 7.2	Thermal Comfort , Permanent Monitoring System